

**In the Specification:**

Please replace paragraphs [0027], [0031], [0039], [0049]-[0055], [0057], [0064], and [0066], as follows:

[0027] The system 100 generally includes multiple distinct regions. The first region is a front end staging area 102. The front end staging area 102 supports wafer cassettes 109 pending processing. The wafer cassettes 109, in turn, support substrates or wafers 113. A front end wafer handler 118, such as a robot, is mounted on a staging platform adjacent to wafer cassette turntables. Next, the system 100 includes a loadlock chamber 120. Wafers 113 are loaded into and unloaded from the loadlock chamber 120. Preferably, the front end wafer handler 118 includes a wafer mapping system to index the substrates 113 in each wafer cassette 109 in preparation for loading the substrates 113 into a loadlock cassette disposed in the loadlock chamber 120. Next, a transfer chamber 130 is provided. The transfer chamber 130 houses a wafer handler ~~136~~ 138 that handles substrates 113 received from the loadlock chamber 120. The wafer handler ~~136~~ 138 includes a robot assembly 138 mounted to the bottom of the transfer chamber 130. The wafer handler ~~136~~ 138 delivers wafers through sealable passages 136. Slit valve actuators 134 actuate sealing mechanisms for the passages 136. The passages 136 mate with wafer passages 236 in process chambers 140 (shown in Figure 2) to allow entry of substrates 113 into the processing regions for positioning on a wafer heater pedestal (shown at 228 in Figure 2).

[0031] Each of the processing regions 218, 220 also preferably includes a gas distribution assembly 208 disposed through a chamber lid 204 to deliver gases into the processing regions 218, 220. The gas distribution assembly 208 of each processing region normally includes a gas inlet passage 240 which delivers gas into a shower head assembly 242. The showerhead assembly 242 is comprised of an annular base plate 248 having a blocker plate 244 disposed intermediate a face plate 246. The showerhead assembly 242 includes a plurality of nozzles (~~not shown schematically at 248 in Figure 3~~) through which gaseous mixtures are injected during processing. The ~~nozzles 248~~ showerhead assembly 242 directs gas, e.g. propylene and argon,

downward over a substrate, thereby depositing an amorphous carbon film. An RF (radio frequency) feedthrough provides a bias potential to the showerhead assembly 242 to facilitate generation of a plasma between the face plate 246 of the showerhead assembly 242 and the heater pedestal 228. During a plasma-enhanced chemical vapor deposition process, the pedestal 228 may serve as a cathode for generating the RF bias within the chamber walls 202. The cathode is electrically coupled to an electrode power supply to generate a capacitive electric field in the deposition chamber 200. Typically an RF voltage is applied to the cathode while the chamber body 202 is electrically grounded. Power applied to the pedestal 228 creates a substrate bias in the form of a negative voltage on the upper surface of the substrate. This negative voltage is used to attract ions from the plasma formed in the chamber 200 to the upper surface of the substrate. The capacitive electric field forms a bias which accelerates inductively formed plasma species toward the substrate to provide a more vertically oriented anisotropic deposition, and a more vertically oriented anisotropic etching of the substrate during cleaning.

[0039] Certain parts of a process kit 40 for a deposition chamber are visible in Figures 4 and 5. These include a top pumping liner 410, a supporting ~~C-channel~~ circumferential channel liner 420, a middle liner 440 and a bottom liner 450. As noted, these liners 410, 420, 440 and 450 are shown and will be described in greater detail in connection with Figure 7, below. A seal member 427 is provided at an interface of the ~~C-channel~~ circumferential channel liner 420 with a pumping port liner 442, and at an interface of the pumping liner 410 with the pumping port liner 442, as will be also shown and described in greater detail in connection with Figure 6A, below.

[0049] Returning to Figure 5, the chamber 400 next comprises a circumferential channel liner 420. ~~In the arrangement of Figure 7, the liner 420 has a profile of an inverted "C". In addition, the liner 420 includes a channel portion 422. For these reasons, the liner 420 is designated as a "C-channel liner."~~ The circumferential channel

liner 420 has a ~~inverted "C"~~ configuration is seen more clearly in the enlarged cross sectional view of Figure 6B.

[0050] Looking again at Figure 6B, the ~~C-channel~~ circumferential channel liner 420 has an upper arm 421, a lower arm 423, and an intermediate inner body 422. The upper arm 421 has an upper shoulder 424 formed therein. The upper shoulder 424 is configured to receive the upper lip 414 of the pumping liner 410. At the same time, the lower arm 423 is configured to receive the lower shoulder 416 of the top liner 410. This interlocking arrangement between the top liner 410 and the ~~C-channel~~ circumferential channel liner 420 provides a circuitous interface that substantially reduces unwanted parasitic pumping. In this way, as gases are exhausted from the processing area region 404 of the chamber 400 and through the pumping holes 412 of the pumping liner 410, gas is preferentially evacuated through the circumferential channel ~~portion 422 of the C-channel~~ liner 420, and is not lost at the interfaces between the top liner 410 and the ~~C-channel~~ circumferential channel liner 420.

[0051] It is to be noted that the interlocking relationship between the upper lip 414 of the pumping liner 410 and the upper shoulder 424 of the ~~C-channel~~ circumferential channel liner 420 is illustrative only. Likewise, the interlocking relationship between the lower shoulder 416 of the pumping liner 410 and the lower lip 426 of the ~~C-channel~~ circumferential channel liner 420 is illustrative only. In this respect, it is within the scope of the present invention to include any interlocking arrangement between the pumping liner 410 and the ~~C-channel~~ circumferential channel liner 420 to inhibit parasitic pumping of processing, cleaning or etch gases. For example, and not by way of limitation, both the upper lip 414 and the lower shoulder 416 of the pumping liner 410 could be configured to extend outwardly from the radius of the top liner 410. In such an arrangement, the lower lip 426 of the ~~C-channel~~ circumferential channel liner 420 would be reconfigured to interlock with the lower shoulder 416 of the pumping liner 410.

[0052] In the process kit 40 arrangement of Figures 6A, 6B and 7, the upper shoulder 424 is circumferentially disposed along the upper arm 421. For this reason,

the upper shoulder 424 is visible in both Figure 6A and Figure 6B. However, the lower lip 426 does not circumferentially encompass the ~~C-channel~~ circumferential channel liner 420, but is also left open in the area of the upper pumping port liner 442. Thus, a radial portion is left open to form a pumping port liner opening 429.

[0053] As indicated from the cutaway perspective view provided in Figure 6, areas 6A and 6B show opposite ends of the chamber 400. The cutaway end from area 6A includes gas exhaust ports, referred to as "pumping port liners" 442, 444. An upper pumping port liner 442 is provided below the circumferential channel ~~portion~~ 422 of the ~~C-channel~~ liner 420. A lower pumping port liner 444 is then provided in fluid communication with the upper port liner 442. Gas may then be exhausted out of the lower pumping port liner 444 and away from the processing chamber 400 by means of an exhaust system.

[0054] To further limit parasitic pumping at the area of the pumping port liners 442, 444, a seal member 427 is provided at the interface between the ~~C-channel~~ circumferential channel liner 420 and the upper pumping port liner 442, and at the interface between the top liner 410 and the upper pumping port liner 442. The seal member is visible at 427 in both Figure 7 and Figure 6B. Preferably, the seal member 427 defines a circular ring that encompasses the upper pumping port liner 442. The seal member 427 is preferably fabricated from a Teflon material or otherwise includes a highly polished surface. The seal 427 further enables the ~~C-channel~~ circumferential channel liner 420 to interlock with the pumping ports port liners 442, 444 and to limit gas leakage.

[0055] Referring back to Figure 7, a middle liner 440 is next disposed below the ~~C-channel~~ circumferential channel liner 420. The middle liner 440 resides in the process region 404 at the level of the slit 432. It can be seen from Figure 7 that the middle liner 440 is a C-shaped liner, and is not circular. The open area in the middle liner 440 is configured to receive wafers as they are imported into the process chamber 400. The middle liner 440 can be partially seen in both Figure 6A and Figure 6B, residing below the C-channel liner 420 and the top liner 410.

[0057] It should be noted at this point that it is within the scope of the present invention to utilize a process kit wherein selected liners are integral to one another. For example, the middle liner 440 could be integrally formed with the bottom liner 450. Similarly, the top liner 410 could be integral to the ~~C-channel~~ circumferential channel liner 420. However, it again is preferred that the various liners, e.g., liners 410, 420, 440 and 450 be separate. This substantially reduces the risk of cracking induced by thermal expansion during heating processes. The employment of a separate but interlocking pumping liner 410 and ~~C-channel~~ circumferential channel liner 420 provides an improved and novel arrangement for a process chamber process kit.

[0064] It is understood that the AFP<sup>TM</sup> chamber 400 of Figure 7 is illustrative, and that the improvements of the present invention are viable in any deposition chamber capable of performing PECVD. Thus, other embodiments of the inventions may be provided. For example, the pumping liner 410 may have an inner diameter that is smaller than the inner diameter of the ~~C-channel~~ circumferential channel liner 420. This reduced dimension for the top pumping liner 410 serves to reduce the inner diameter of the pumping port 405, thereby increasing velocity of gases moving out of the processing region 404 and through the pumping port 405. Increased gas velocity is desirable, as it reduces opportunities for carbon containing residue buildup on chamber surfaces. It is also desirable that the liners be fabricated from a material having a highly smooth surface. This serves to reduce amorphous carbon deposition from accumulating on the surface. Examples of such material again include polished aluminum, polymer coating, Teflon, ceramics, and quartz.

[0066] While the foregoing is directed to embodiments of the present invention, other and further embodiments of the invention may be devised without departing from the basic scope thereof. For example, one embodiment of a process kit for a vacuum processing chamber is provided, comprising a circumferential pumping liner configured to be placed within the processing region of a processing chamber, and a circumferential ~~C-channel~~ circumferential channel liner configured to be placed along an outer diameter of the pumping liner. The pumping liner may include a circumferential body having an upper surface and a lower surface, and a plurality of

pumping holes disposed along the body. The ~~C-channel~~ circumferential channel may comprise a circumferential body portion having an upper surface and lower surface; a circumferential upper arm disposed proximate the upper surface of the body portion of the ~~C-channel~~ circumferential channel liner; a lower arm disposed around a selected radial portion of the body portion of the ~~C-channel~~ circumferential channel liner, the lower arm being along a bottom end of the body portion of the ~~C-channel~~ circumferential channel liner; and a channel portion in the ~~C-channel~~ circumferential channel liner defined between the body portion, the upper arm, the lower arm and an outer diameter of the pumping liner. An upper interlocking feature is provided between the upper surface of the pumping liner and the upper arm of the ~~C-channel~~ circumferential channel liner. Similarly, a lower interlocking feature is provided between the lower surface of the pumping liner and the lower surface of the ~~C-channel~~ circumferential channel liner. The upper and lower interlocking features serve to inhibit parasitic pumping within the processing region during processing of a wafer.